



ETHYLENE OXIDE COMPLIANCE PLAN

Written plan to reduce exposures to less than 1.0 ppm or the lowest feasible level by the use of engineering and work practice controls, where feasible, supplemented by the use of respiratory protection.

- Required where exposure are ≥ 1.0 ppm.
- Annual review of plan will be conducted during the Industrial Hygiene Review.
- Routine equipment leak checks.
- Written emergency plan.
- Sources of exposure.
- Outline planned control measures.

OUTLINE OF ETHYLENE OXIDE (EtO) COMPLIANCE PLAN

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ETHYLENE OXIDE COMPLIANCE PLAN FORMAT

I. INTRODUCTION

This plan has been prepared to provide guidance, to reduce exposures to ethylene oxide (EtO) at the BASF Polyol Plant located at Wyandotte, Michigan. This plan has been prepared to comply with the requirements of the OSHA Ethylene Oxide Standard Title 29 CFR 1910.1047, Paragraph (f) (2) (i through iv inclusive).

The following sections of this plan outline the various actions which will be taken to assure that all BASF employees' exposures will be kept lower than the OSHA permissible exposure limit of 1.0 part per million (ppm) as a time weighted average (TWA).

II. EXPOSURE MONITORING PROGRAM

Using a combination of personal and area air sampling, BASF will routinely monitor employee exposures to ethylene oxide. Data collected from this program will be used to designate those areas where controls are needed. It is recognized that monitoring each and every employee is not feasible, therefore a program has been established whereby representatives of each job classification potentially exposed to EtO are monitored.

A. Frequency of Monitoring

- 1) All job classifications which may be exposed to ethylene oxide will be sampled at least annually.
- 2) Additional samples will be required whenever a change is made in the process, control equipment, or work practices which might result in new or additional exposures.

The results of the sampling program are being used to identify any prioritized projects to reduce exposures.

B. Methods of Measurement

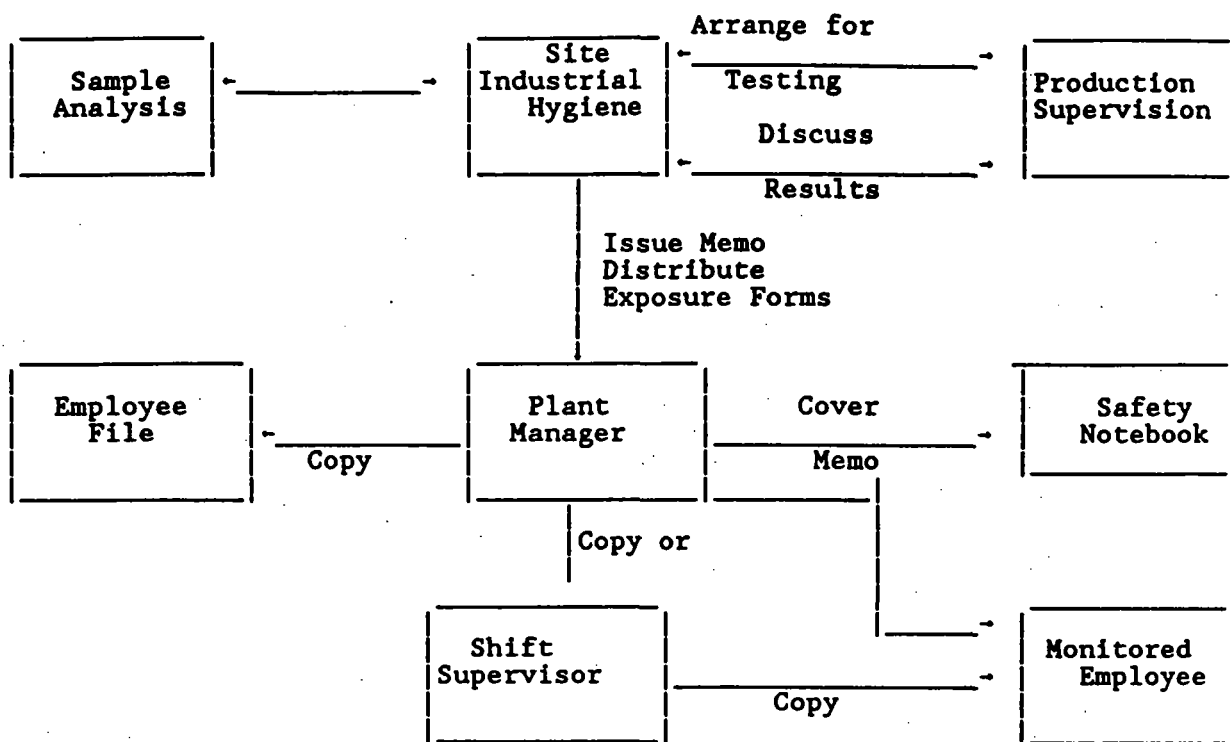
The Corporate Industrial Hygiene Department is responsible for recommending and approving methods of measurement employed by BASF. The following methods have been approved and are being used at the Wyandotte Polyol Plant.

1. 3M 3550 ethylene oxide badges are being used for time weighted average measurements.
2. Quazi-Ketchum charcoal tubes are being used for short-term or ceiling measurements.
3. Colorimetric detector tubes from mattsesson Kitagawa are being used for instantaneous readings or leak detection.
4. Neotronics Exotox gas monitor readings for flammable vapors are taken before doing any work which could create sparks.

C. Reporting of Results

Sample results will be reported by memo from the site Industrial Hygiene Representative to the Plant Manager. Monitoring results will be sent to the employee in writing within 15 working days of receiving results.

SAMPLING/DISTRIBUTING RESULTS



III. Leak Detection Program

EtO is handled in closed systems because it presents a serious fire and explosion hazard as well as a health hazard. All leaks which are detected will be repaired as quickly as possible. The following procedures have been implemented to detect and prevent leaks from occurring.

- A. All gaskets are replaced at least once every five years.
- B. Double mechanical seals on pumps are checked at least daily for leakage. This is documented on the operator's safety check list.
- C. No. 7 Reactor, No. 8 Reactor and No. 8 Initiator are vacuum or pressure checked before each manufactured batch. This is documented on the Batch Control Sheets.
- D. Storage areas are inspected for leaks each shift. This is documented on the Pond Watch Check List.

IV. MEDICAL PROGRAM

A. Employees Covered

All BASF employees who work in areas where they may be exposed to EtO will receive a pre-employment physical examination and annually thereafter will receive a complete medical examination. An annual summary of monitoring results will be prepared by Corporate Industrial Hygiene and provided to the Corporate Medical Department for the purposes of determining who must be included in the medical surveillance program.

B. Exam Protocol

The tests required in the medical examination have been designated by the Corporate Medical Department.

V. EMPLOYEE TRAINING

BASF believes that all employees should be aware of the toxicity of the chemicals to which they may be exposed. An employee who is aware of the potential hazards on their job will take more care in performing the job so as to avoid injury or exposure. It is, therefore, our philosophy that employees be informed of the hazards associated with their job and the methods to control the hazards on a regular basis.

The employee training program is provided to employees in the following job classifications:

Production Operators
Chemical Handlers
Relief Operators
Maintenance Mechanic
EPO Operators

Instrument Technicians
Production Supervision
Maintenance Supervision
Laboratory Technician
Laboratory Supervisor

This training is conducted on an annual basis. Copies of training records are located in the Polyol Plant Safety and Training Center for Production personnel, in the Maintenance Scheduler's Office for Maintenance personnel and in the Q.C. Laboratory for laboratory employees.

VI. RESPIRATORY PROTECTION PROGRAM

The Respiratory Protection Program is located in the Occupational Health Manual which is located at the following locations:

- A. Polyol Plant Main Office Building
- B. Control Room
- C. No. 3 Blend Building
- D. Production Supervisor's Office
- E. QC Laboratory
- F. Polyol Training Officer's Office

Annual training in the use of respirators is conducted and the documentation is located in the Polyol Plant Safety and Training Center.

The following respirators have been approved for use for EtO and are currently being used: self-contained breathing apparatuses, positive pressure airline masks, and the MSA ethylene oxide canister (Part #473881) gas mask. Routine operations requiring the use of respirator protection are listed in Section VIII.

Guidelines for the use of respiratory protective equipment are as follows:

- <0.5 ppm - respiratory protection not required.
- >0.5 <50 ppm - MSA gas masks with EtO canister.
- >50 ppm - self-contained breathing apparatus.

VII. EMERGENCY PLAN

A plant wide/site-wide emergency plan is located in the Production Shift Supervisor's Office. This plan includes appropriate actions for an EtO emergency. Specific guidelines for EtO are:

A. Definition of Emergency

An emergency, for purposes of this plan, is defined as any unexpected release of ethylene oxide which results in an atmospheric concentration of >500 ppm.

B. Emergency Guidelines

Upon discovery of an emergency, the following actions will be taken:

1. Sound alarm and evacuate to an upwind area.
2. Using protective equipment, attempt to stop leak.
3. If the leak cannot be controlled immediately, use one of the monitoring methods listed in Section IIB. to establish a vertical and horizontal (if applicable) regulated area using 5.0 ppm as an outer boundary concentration. Employees entering the restricted area must wear personal protective equipment suitable for the situation at hand.
4. Isolate and repair problem.
5. After the problem is repaired, recheck area for EtO concentrations before cancelling emergency condition.

VIII. SUMMARY OF POTENTIAL EtO EXPOSURE CONDITIONS AND COMPLIANCE METHODS

Operations which may result in exposures in excess of the OSHA permissible exposure limit and current and/or anticipated methods of controlling those exposures are summarized in the attached table.

CURRENT AND PROPOSED COMPLIANCE METHODS SUMMARY
(Example)

<u>Eto SOURCES(S)</u>	<u>CURRENT CONTROL MEASURES</u>	<u>PROPOSED CONTROL MEASURES</u>
Tankcar Connect/ Disconnect	MSA Gas Masks, Eto Unloading Procedure* Protective Clothing	No Modifications Recommended
QA Sampling	MSA Gas Masks, Eto Unloading Procedure* Protective Clothing	No Modifications Recommended
Pump Repair	SurvivAir Pack**, Plant Engineering Safety Guideline*, Airline Respirator	No Modifications Recommended
PSV Removal	MSA Gas Masks, Plant Engineering Safety Guideline*	No Modifications Recommended
Line Breaking	SurvivAir Pack**, Plant Engineering Safety Guideline*, Airline Respirator	No Modifications Recommended
Process/Storage Tank Entry	Airline Respirators, Plant Engineering Safety Guideline*	No Modifications Recommended

* See Section IX.

** All SCBA's are SurvivAir Models

IX. OPERATING PROCEDURES

The procedures which are currently being used to unload rail-cars perform maintenance tasks are attached.

X. COPIES OF COMPLIANCE PLAN

Copies of this plan are located with the Plant Manager, site Safety Coordinator, site Industrial Hygiene Representative, Corporate Industrial Hygiene Department, and in Polyols Plant Occupational Health Manuals.

Safety And Health Practices And Procedures

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Wyandotte Site

Subject: CONTAMINATED EQUIPMENT		
Number: W-8	Section: METHODS	Issued By: 

I. PURPOSE

To minimize toxic chemical exposure while working on equipment which may contain or may be contaminated by the materials listed herein.

II. OBJECTIVE

To prevent injury to the health of any employee which could result from exposure to excessive air concentrations of, or skin contact with, the materials listed herein.

III. SCOPE

All equipment, including, but not limited to pumps, pipes, storage tanks, vessels, vacuum system, filters, condensers, vent lines, incinerators, and any other equipment which comes in contact with the following materials is covered by this procedure.

- A. Acrylonitrile (AN) - The raw material, mixed monomer, or unstripped graft polyol.
- B. Ethylene Oxide (EtO) - The raw material or unstripped EtO-based polyol.
- C. Toluene Diisocyanate (TDI)
- D. Propylene Oxide (PO) - The raw material or unstripped PO-based polyol.
- E. Toluenediamine (TDA)

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CONTAMINATED EQUIPMENT

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IV. PROCEDURE

The primary concerns related to the handling of contaminated equipment are vapor exposure and skin contact with the material. An additional responsibility exists to prevent contamination of the environment with the material. In order to protect personnel, it is necessary to either remove all of the material and material residue from equipment before work is performed or to ensure proper personal protective equipment is worn.

A. Preparation

The primary responsibility for the preparation of a system or equipment shall rest with the operation department of the area where the equipment is located.

An additional responsibility shall rest with the servicing personnel, who will determine that, to the best of their knowledge, the provisions of this procedure have been followed before work is begun.

When implementing this standard, the following is to be effected on any equipment covered under the SCOPE of this procedure.

1. Designate a restricted area around each point where contaminated equipment will be handled. The restricted area should be roped off and extend vertically, as well as horizontally. The area within the rope is to be determined by vapor-monitoring equipment and prudent judgment. Industrial Hygiene must be consulted when doubts arise.

In addition, signs must be posted that contain the following legend:

**DANGER
CHEMICAL HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING MAY BE
REQUIRED TO BE WORN IN THIS AREA**

2. The system or equipment must be shut down according to prescribed area procedures. Minimum procedures are:
 - a. Using nitrogen to blow the material from the system to a vessel.

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- IV. A. 2. b. Draining all of the material residues from the nearest low point for disposal by production personnel in accordance with current procedures for hazardous wastes. Containers used to hold the material will have the required waste labels and the name and address of the chemical manufacturer, importer, or other responsible party.
- c. Flushing and draining the system utilizing purge cycles or water.
- Disposal of flush water will be consistent with established procedures.
- d. Isolation of the system in accordance with Lock, Tag, and Try.
- e. Preparation for vessel entry, if applicable.

B. Testing for Contamination

Draining of material will usually not decontaminate equipment adequately. Flushes or purges must be used to minimize the potential for exposure, but will not ensure an uncontaminated condition. Therefore:

1. All equipment which has been in contact with the materials listed herein will be assumed to be contaminated until it is COMPLETELY disassembled and proven to be otherwise through test procedures.
2. If the equipment has been thoroughly cleaned such that no material residue remains, and tests have proven the atmosphere within the equipment and the equipment's immediate area is less than the Permissible Exposure Limit (PEL), the equipment will be considered decontaminated and further application of this standard is not required. However, extra caution should be taken when handling absorbent materials (gaskets, seals) which may contain material residue.

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- IV. B. 3. If the equipment cannot be cleaned to eliminate material residues and to meet the PEL criteria, a restricted area will be created around the equipment and will not be removed until the equipment and the area are determined safe by testing and prudent judgment. The area around the work will be designated a restricted area until the PEL is not exceeded within two (2) feet of the piping and/or equipment. Extra caution should be taken when handling absorbent materials (gaskets, seals) which may contain material residues.
4. Areas which have been found to be decontaminated will be reclassified as restricted until proven otherwise if additional disassembly is required. This additional disassembly most often involves piping.

C. Working on Contaminated Equipment

All persons entering a contaminated vessel or the restricted area must be wearing the following equipment as a minimum:

1. Impermeable full body suit. (Remove valuables, watches, wallets, etc. because personal clothing may have to be discarded). (See IV. D. 6. below).
2. Rubber boots and impermeable gloves. Please note: coat sleeves must extend over gloves and be sealed to gloves with tape. Pant legs are worn outside of boots and sealed to boots with tape.
3. Contamination requires the wearing of an air-supplied respirator when material or material residue is present or when entering a vessel. In all other instances of contamination, a full face gas mask with appropriate canister or air-supplied respirator is required.

No employee will work alone on contaminated equipment or systems which show residual levels at or above the PEL. The employees will watch and prevent unauthorized persons from entering the roped-off area.

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- IV. C. NOTE: The protective equipment requirements for the restricted area can be modified consistent with implementation of other, concurrent protective measures. For example, equipment can be disassembled on an operating down-draft table which is vented out of the building. This will eliminate the respirator requirements. As such, the required minimum protective equipment would be a full face shield and impermeable gloves and jacket.
- D. Upon completion of work in a restricted area, clean up must follow the following sequence:
1. The protective clothing and respiratory protective equipment must not be removed until all tools, equipment, and the restricted area are determined to be decontaminated.
 2. Before tools are removed from the restricted area, they will be cleaned. Prudent judgment is the best measure of the adequacy of cleaning. When questions exist concerning the adequacy of cleaning, the tools can be placed in a plastic bag and vapor analyzer utilized to check for vapors in the bag. The levels for adequately cleaned tools will not exceed the PEL.
 3. Before equipment is brought into the Maintenance Shop, designated for return to inventory, or scrapped, it must be rechecked for contamination. Particular attention must be given to items which may hold fluid, e.g. mechanical seals.
 4. The restricted area will be isolated in a manner which will contain potential spills. Particular care will be taken to sanitize all areas where a minor spill may have occurred, either through physically removing the material and/or flushing the material to the sewer if NPDES compliance is maintained.
 5. If the protective clothing has come in contact with the material, the protective clothing and respiratory protective equipment will not be removed until the employee has taken a safety shower while wearing the clothing and respirator. The most suitable shower for this is a special safety shower dedicated for this purpose.

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- IV. D. 6. Remove protective clothing and respiratory equipment. Place gas mask canisters and protective clothing in a plastic bag and discard, using approved disposal procedures. Clean respiratory protective equipment as instructed in Respiratory Protection Manual.
7. Personal clothing will be tested for contamination, when questions exist. Place personal clothing, excluding shoes, in a plastic bag. Place shoes in a separate plastic bag. Check for vapors in each bag. If levels are less than the PEL, clothing may be returned to the employee. If levels are in excess of the PEL, the clothing shall not be returned to the employee until the contamination is dissipated. In some instances, the contaminated clothing may have to be replaced. Contaminated shoes will always be replaced.
8. The employee must take a hot, soapy shower after working in a designated contaminated work area or with contaminated equipment.

ETHYLENE OXIDE (EO) TANK CAR UNLOADING PROCEDURE **PAGE 1**
(WP\BLENDS\EO-UNLOA) Revised 1992

DATE: _____

TANK CAR: _____

TIME STARTED: _____

UNLOADERS INITIALS _____ WEIGHT _____ LBS.

(SEE SWITCH LIST TO GET T/C WEIGHT)

1. Refer to Material Safety Data Sheets (MSDS) and Occupational Health Manual (OHM) for further safety information.
2. If any difficulties are encountered during the transfer or if the tank car does not meet all inspection requirements, STOP and notify your supervisor.
3. Make sure the wheel chocks are in place and the derail is set, with the "STOP - MEN AT WORK" sign in position. Also make sure tank car handbrake is set.
4. Connect ground cable to the body bolster on the tank car and check light to assure proper ground connection is made. Connect ground cable on the rack to the top of the car near to the unloading valve.
5. Inspect tank car to make sure it is equipped with the following:
 - _____ 2" equalization/nitrogen valve
 - _____ 2" top unloading valve
 - _____ 75 psig pressure relief valve
 - _____ Vacuum relief valve
 - _____ Tank Car Stencilled "Inhalation Hazard"
6. Check with lab to verify that tank car contains EO according to supplier's certificate of analysis. Also check tank car placard for proper identification number. For EO this number is "1040". The car should also have a "Flammable Gas" placard.

ETHYLENE OXIDE (EO) TANK CAR UNLOADING PROCEDURE
(WP\BLENDS\EO-UNLOA) Revised 1992

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7. Put on required equipment for EO transfer:
 - a. Full face respirator with GMEO cannister.
 - b. Rubber gloves.
 - c. Full rubber suit.
 - d. Rubber boots.
8. Make sure that two people are present when unloading a hazardous material.
9. Hook up stainless steel hose from end of unloading boom to top unloading valve on tank car. CAUTION: USE ONLY NON-SPARKING TOOLS (BRASS).
10. Pressurize unloading boom with N₂ to verify that knock-union does not leak.
11. Hook up stainless steel hose from 50 psi. nitrogen supply to tank car equalizer/nitrogen valve. CAUTION: USE ONLY NON-SPARKING TOOLS (BRASS).
12. Double check all hoses and lines to make sure all connections are secure and hang the portable flammable vapor detector inside the dome box on the tank car.
13. Set up proper valving to transfer EO to the desired storage tank(TK-101-B). At this time reset the vortex flow meter in the "rawhide barn" to "0".
14. After EO flow is established for several minutes, throttle valve at pump discharge to force liquid through the sample bomb.
15. After flowing through sample bomb for one minute the sample bomb will be purged. Close sampler outlet and inlet valves and shut off EO pump. Also close unloading valve and equalizer/nitrogen valve on tank car.
16. Do not resume unloading until EO quality check is approved by the lab.

Quality Check OK? _____ (Y/N)

ETHYLENE OXIDE (EO) TANK CAR UNLOADING PROCEDURE **PAGE 3**
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17. When sample is approved by lab, resume transfer to storage. Once flow is re-established shut off nitrogen supply to tank car and switch over to equalizer line.
18. Record tank levels and "EO" Vortex meter readings every hour and check pressure gauge on equalizer line. Transfer must be done under equalization.

<u>DATE</u>	<u>TIME</u>	<u>TANK LEVEL,% 101B</u>	<u>"EO VORTEX" METER READINGS, LBS.</u>	<u>TC PRES- SURE, PSIG</u>	<u>INITIALS</u>
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

**** MAXIMUM TANK INVENTORY IS 85%. DO NOT UNLOAD TO AMOUNTS ABOVE 85%**

19. When transfer under equalization ceases, unload tank car using 50 psi nitrogen until tank car goes empty. DO NOT LEAVE THE AREA WHEN PRESSURE UNLOADING. When you no longer see EO flow through the sight glass, shut down transfer.
20. Blow-out unloading boom and hose back into the tank car using the 50 psi nitrogen supply.
21. Close unloading valve and equalizer/nitrogen valve on tank car. Then bleed and disconnect hoses from car.
22. Screw plugs back into unloading valve and N₂/equalizer valve. Tighten plugs wrench-tight then put seal on metal hatch cover. Note seal number below:

Seal Number _____

23. Turn placards over so that the "RESIDUE" and "FLAMMABLE GAS RESIDUE" labels are visible. Tank car must have these signs visible before it can be released. Also remove grounding cable from the tank car.

ETHYLENE OXIDE (EO) TANK CAR UNLOADING PROCEDURE
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24. Calculate difference between total lbs. unloaded and initial tank car weight. Notify shift supervisor if difference is over 2500 lbs.

Total lbs. unloaded (from Vortex Meter) _____ lbs.

Tank car weight (see pg. 1.) _____ lbs.

Difference _____ lbs.

25. Notify supervisor that transfer is completed and return completed paperwork to Shift Supervisor's Office.

DATE FINISHED: _____

TIME FINISHED: _____

UNLOADER'S INITIALS _____